INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT

BULK SPECIFIC GRAVIY of AGGREGATE BLENDS with RAP
ITM No. 584-08T

1.0 SCOPE.

1.1 This test method covers the procedure to determine the bulk specific gravity (Gsb) of a combined aggregate blend with RAP used in an HMA mixture.

1.2 The values stated in either English or acceptable SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other, without combining values in any way.

1.3 This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0 REFERENCED DOCUMENTS.

2.1 AASHTO Standards.

R 35   Superpave Volumetric Design for Hot Mix Asphalt
T 84   Specific Gravity and Absorption of Fine Aggregates
T 85   Specific Gravity and Absorption of Coarse Aggregate
T 100   Specific Gravity of Soils
T 209   Maximum Specific Gravity of Bituminous Paving Mixtures

2.2 ITM Standards.

207   Sampling Stockpiled Aggregates
586   Binder Content by Ignition
571   Quantitative Extraction of Asphalt and Gradation of Extracted
        Aggregate from Asphalt Paving Mixture.

2.3 Other References.

SP-2   Superpave Level 1 Mix Design by Asphalt Institute

3.0   **TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.

4.0   **SIGNIFICANCE AND USE.**

    4.1   This ITM is used to determine the bulk specific gravity of a combined aggregate blend with RAP used in HMA mixture.

    4.2   The bulk specific gravity (Gsb) of a combined aggregate blend is calculated using an estimate of the bulk specific gravity of the aggregate in the RAP and the actual bulk specific gravity of the other aggregates.

    4.3   The bulk specific gravity of an aggregate blend is used to perform a volumetric analysis on compacted HMA in accordance with AASHTO R 35.

5.0   **APPARATUS.** The apparatus shall be as stated in the referenced test methods.

6.0   **SAMPLING.** Sampling shall be as stated in the referenced test methods.

7.0   **PROCEDURE.**

    7.1   Identify the coarse aggregate(s), fine aggregate(s) and RAP selected for use in the Superpave mix design

    7.2   Identify and record the actual percentages for each of the aggregate components used in the combined aggregate blend of the Superpave mix design

    7.3   Obtain a representative sample of the coarse aggregate, fine aggregate mineral filler and RAP in accordance with ITM 207

    7.4   Determine and record the bulk specific gravity of each of the coarse aggregate(s) in accordance with AASHTO T 85

    7.5   Determine and record the bulk specific gravity of each of the fine aggregate(s) in accordance with AASHTO T 84

    7.6   Determine and record the maximum specific gravity of the RAP in accordance with AASHTO T 209

    7.7   Determine and record the asphalt content of the RAP in accordance with ITM 571

7.8 Calculate and record the effective specific gravity of the RAP aggregate as follows:

$$G_{se} = \frac{100 - PbRAP}{((100/GmmRAP - (PbRAP/GbRAP))}$$

where:
   Gse = effective specific gravity of the RAP aggregate
   PbRAP = percent binder of the RAP
   GmmRAP = maximum specific gravity of the RAP
   GbRAP = specific gravity of asphalt in the RAP (use 1.03 if unknown)

7.9 Calculate and record the bulk specific gravity of the combined aggregate blend as follows.

$$Gsb = \frac{\%CA1 + \%CA2 + \%FA1 + \%FA2 + \%BHF + \%RAP}{\dfrac{\%CA1}{Gsb} + \dfrac{\%CA2}{Gsb} + \dfrac{\%FA1}{Gsb} + \dfrac{\%FA2}{Gsb} + \dfrac{\%BHF}{Gsb} + \dfrac{\%RAP}{Gse}}$$

where:
   GsbBlend = bulk specific gravity of the combined aggregate blend
   Gsb = bulk specific gravity of each respective aggregate
   Gse = effective specific gravity of the RAP
   %CA1 = percent of aggregate blend that is course aggregate #1
   %CA2 = percent of aggregate blend that is course aggregate #2
   %FA1 = percent of aggregate blend that is fine aggregate #1
   %FA2 = percent of aggregate blend that is fine aggregate #2
   %BHF = percent of aggregate blend that is bag house fines
   %RAP = percent of aggregate blend that is RAP

8.0 **REPORT.** The Gsb of the combined aggregate blend is reported to the nearest 0.001.